

GOAL:**10**

Reduce the potential impact of natural hazards on the State's citizens and guests, critical support services and facilities, infrastructure, historic resources, economy, and natural resources.

Development patterns in New Hampshire, and across the country, have been sprawling outward from our community centers, consuming more land and natural resources, with little regard for the potential impacts to natural hazards, or even what risks those hazards may pose to the new development. Developments may be susceptible to flooding, wildfire, and high winds, and often the development impacts increase the severity of flooding in the State's communities by increasing the amount of impervious surface and thereby increasing the volume and intensity of stormwater runoff. Oftentimes, construction is allowed within hazard areas either inadvertently or because construction in that location meets an economic need of either the community or the builder. When these decisions are weighed against the vulnerability and long-term risks, it is often apparent that development in local hazard zones may pose an unrecognized economic liability to the community.¹

Recent data indicates that climate change trends and impacts are increasing the frequency and severity of natural hazards in New Hampshire. Temperatures have warmed over the last 100 years with more pronounced changes in the last 30 years. This temperature increase is correlated with other changes, including increased precipitation rates and extreme precipitation events that are projected to become more intense and frequent. Winter precipitation is shifting toward greater amounts of rainfall and less snow, leading to an earlier and faster snow melt that contributes to increased

spring peak stream flows and the frequency and severity of spring floods.² The early snowmelt leads to greater runoff and soil moisture retention earlier in the year. Higher summer temperatures and evaporation rates coupled with a longer summer season elevates the probability and severity of late summer and early fall droughts. Future climate projections continue the aforementioned trends with the potential for the State's climate to shift closer to that of present-day North Carolina and Virginia with a greater chance of flooding.³

Hazard mitigation or actions taken to reduce the long-term risk of natural hazards to people and property, can minimize the traumatic impacts of hazard events.⁴ While not capable of preventing natural disasters, effective mitigation may reduce the potential impact of natural hazards. Hazard mitigation is effectively achieved through increased awareness and protection of the State's residents, the economy, the transportation network, and critical community services and through land use planning, site design and engineering that considers potential hazards.⁵

The New Hampshire Hazard Mitigation Plan provides a comprehensive framework to effectively mitigate and efficiently coordinate the state's services and resources to make New Hampshire communities more resistant to the human and economic impacts of disasters. A wide

variety of hazard types are addressed in the plan including floods, fires, seismic activity, severe winds, winter storms and man-made disasters.⁶

Despite the numerous natural or man-made hazard risks that exist in the State and addressed in the State Hazard Mitigation Plan, flooding and severe winter weather events pose the greatest risk to the State's residents, infrastructure, facilities, and economy – being the only two hazard types with a high risk for both severity and frequency. When broken down by specific hazard types, riverine flooding is the most common disaster event in New Hampshire with the greatest impacts and occurring at less than ten-year intervals.⁷

Flood losses are frequently compounded by localized inundation and fluvial erosion. Inundation occurs where waters rise, fill and damage low-lying structures. A balanced river with an adequate width, depth, and length to carry the water produced in its watershed will minimally erode its bank and change course during floods. However, rivers that lack this equilibrium are susceptible to further increased losses due to fluvial erosion, which range from gradual bank erosion and road washouts to catastrophic changes in river channel location and size. Such erosion led to the flood damages along the Cold River and Warren Brook in the October 2005 flood and the avulsion of the Suncook River in May 2006. Protection of river corridors including the channel, banks and riparian floodplains is essential to accommodate the meander pattern of the river is needed to minimize flood hazard risks and maintain balanced rivers.⁸

In 1996 Governor Stephen Merrill issued Executive Order 96-4, requiring state agencies to comply with municipal floodplain management requirements. This is the sole requirement in place regarding state activities and development in the floodplain. The State of New Hampshire

should set a precedent for municipal governments and citizens, demonstrating stewardship and exceeding existing municipal standards for floodplain management and development. The associated risks of development within the floodplain do not outweigh the potential advantages. State development should seek not merely to satisfy minimum standards but to avoid floodplain development altogether.⁹

STRATEGY 1:

Assess the risks to the State from flooding, winter storms, earthquakes and other natural hazards and improve upon the protection of the general population.

The mission of the State Hazard Mitigation Plan is to “protect the lives, property and environment of the people of New Hampshire from the threat or occurrence of emergencies resulting from any natural or man-made disaster, including but not limited to flood, fire, earthquake, landslides, windstorm, tsunami, technological incidents, drought, terrorism, epidemic, hurricanes and tornadoes.”¹⁰ To effectively implement this mission there must be a full understanding of all hazards and how man-made growth and natural evolution change these risks over time.

Strategy Implementation:

- A. Install necessary and locally significant stream gauges and other such monitoring equipment. Gauges should be equipped with real-time reporting equipment and integrated with the existing stream gauge network.
- B. Implement wildfire suppression and protection plans prepared by the NH Department of Resources and

Economic Development, USDA Resource Conservation and Development, and regional planning commissions.

- C. Support the statewide procurement and analysis of high-resolution topographic data obtainable using airborne light-detection and ranging (LiDAR) technology to better predict floodplain and coastal flooding events.
- D. Enhance the State's capability to monitor and anticipate potential seismic conditions by integrating existing, upgraded, and new real time gauges at Weston Observatory, and disseminate information to the public in a timely manner.
- E. Identify ideal locations and install National Oceanic and Atmospheric Administration weather transmitters that will provide at least 90 percent signal reception.
- F. Organize and train road agents, emergency management directors, and volunteers to perform ice-monitoring activities that will enhance the New Hampshire based U.S. Army Corps of Engineer's Cold Regions Research and Engineering Laboratory database.
- G. Incorporate the identification, risk assessment and mitigation of human-caused hazards in future updates of the State Hazard Mitigation Plan.
- H. Develop a geologic hazards program based on detailed mapping and data to produce landslide probability, liquefaction potential, earthquake shake maps, and other specific hazard data, on a countywide basis, for landslides and seismicity.
- I. Assess and measure changes to flood event frequency and base flood elevations due to climate change.
- J. Gain an understanding of the ability and limitations of dams and dam management to control floods.

- K. Develop fluvial erosion hazard area maps for use by municipalities for town planning purposes and as zoning overlay districts.

STRATEGY 2:

Reduce the potential impact of natural disasters on the State's critical support services, essential facilities, and infrastructure.

Infrastructure protection and utility security, in recent years have become a priority for both emergency planners and policymakers. Given the increasing probability and severity of flood events it will be essential to upgrade existing infrastructure and develop new and higher design standards for culverts, detention ponds, dams, bridges and other infrastructure. Increased design capacity at individual sites must be coupled with careful study of secondary impacts up and downstream from the project location. Protection of utilities, essential facilities and infrastructure during a man-made or natural disaster is essential to our state economy.

Strategy Implementation:

- A. Perform cost-effective upgrades of state-owned dams for the purpose of optimizing operational controls and the mitigation of the effects of floods and support the NH DES Dam Bureau in the execution of dam safety inspections and enforcement programs as needed.
- B. Provide dam safety and maintenance hazard mitigation workshops for municipal and private dam owners.
- C. Facilitate the review of existing local emergency operation plans for potential enhancement with

respect to natural and man-made hazard mitigation initiatives.

- D. Build upon the State's existing *Inventory of State-Owned Critical Facilities* included within the State Hazard Mitigation Plan to provide greater details, such as identifying building typology, for each facility.
- E. Develop new design standards for the State's critical infrastructure as is called for and promoted in the State's Climate Action Plan.¹¹

STRATEGY 3:

Reduce the potential impact of natural disasters on New Hampshire's built environment including its historic resources and those features vital to the State's economy.

New Hampshire has traditionally developed along its more than 16,000 miles of rivers and streams that provided mills with power and transportation during the mid 19th century industrial revolution. This rapid settlement of the State's floodplains has contributed to the State's flood risks, since floodplains' primary function is to naturally carry excessive runoff and overflow from their associated watercourses. Additionally, this development pattern has placed many of the State's historic resources and economic centers directly at risk.¹²

Strategy Implementation:

- A. Assist the State's Historic Preservation Officer and the NH Division of Historical Resources in efforts to inventory, catalogue and assess the State's archeological and historical treasures including buildings, dams, and bridges that are vital to the State's identity and tourism industry.

- B. Determine the availability and adequacy of federal and state resources to buy out and remove or relocate structures in high hazard areas or flood-proof flood-affected property.
- C. Educate the general public and private property owners in regards to cost effective mitigation measures by making information and resources available to facilitate private mitigation initiatives.
- D. Establish a baseline for future hazard mitigation planning with respect to the impact of natural and man-made hazards on the State's economy.
- E. Support the inclusion of planning for economic hazard mitigation and recovery in local hazard mitigation plans.
- F. Conduct an analysis of the past and potential future impacts of natural and man-made disasters on the State's historic and archeological treasures.

STRATEGY 4:

Protect the State's natural resources and environment from the potential impact of natural disasters.

Land conversion from its natural state toward greater degrees of impermeability and characterized by sprawling development patterns, results in reduced storm water retention and altered runoff characteristics. Impervious development of greater than 10 percent of a watershed's area begins to impact water quality and stream channel morphology and leads to increased erosion and sediment production. Stream channels enlarge to accommodate the increased peak storm water discharges and heavier volumes and render existing

stream crossings inadequate. Protection of the State's valuable natural resources and riparian buffers can minimize impacts to the built and natural environments.¹³

Strategy Implementation:

- A. Develop a strategy for mapping existing sensitive natural resources that may be impacted by the various hazard types to be used in mitigation efforts, project approval and in future disaster field offices.
- B. Develop fluvial erosion studies and hazard risk assessments that identify the location and intensity of fluvial erosion hazards, essential riparian areas needed by rivers to maintain equilibrium, and provide the scientific data needed to reduce flooding impacts through environmentally sound solutions.
- C. Expand the State's surficial geologic mapping program to complete every quadrangle in the State at the same scale and detail level as was used to map 86 quadrangles (40 percent of the 213 quadrangles in the State) prepared in cooperation with the National Cooperative Geological Mapping Program.
- D. Support multi-objective resource management by convening stakeholders to study the integration of floodplain management, hazard mitigation, watershed, and stormwater management practices.
- E. Assess the effectiveness of municipal land use controls including floodplain development and stormwater control regulations and their ability to protect public safety, health, and the environment.

STRATEGY 5:
Promote future development that considers, and avoids or mitigates, potential natural hazards.

The best way to ensure disaster resistant communities in the future is to ensure sustainable community planning and development. New Hampshire's communities have been seeing increased damages and infrastructure maintenance costs attributable to unsustainable development patterns and construction techniques. Ever increasing impervious surfaces lead to greater runoff volumes and velocities, in turn increasing flood related impacts during heavy rainfalls. Sustainable land use development avoids developing sensitive areas such as wetlands, floodplains, steep slopes, and other hazard areas. Sustainable communities protect these natural resource areas while concentrating needed development to areas of existing development – promoting infill and brownfield development and the use of low impact development. “An essential characteristic of a sustainable community is its resilience to disasters.”¹⁴

Strategy Implementation:

- A. Support local communities, with assistance from the Regional Planning Commissions, in the creation of local and regional multi-mitigation plans.
- B. Continue to work with the State's Hazard Mitigation Team to select cost beneficial projects that address the State's hazard mitigation goals and objectives.
- C. Provide floodplain management training and develop local policies and procedures that promote responsible use of designated floodplain areas.
- D. Examine the applicability of higher regulatory standards such as future conditions hydrology, compensatory flood storage, freeboard requirements above the base flood elevation, or no build zones for state supported projects located within floodplains.

- E. Develop new model floodplain development ordinances and regulations that exceed the minimum standards of the National Flood Insurance Program and anticipates the increasing frequency and magnitude of flood events.
- F. Educate communities on how to incorporate their hazard mitigation plan into the capital improvements program, particularly for public investments in infrastructure, public buildings and facilities.
- G. Develop guidance on how to prepare a local master plan's hazards section, permitted by RSA 674:2, and its implementation through land use regulations.
- H. Map sensitive natural resources and infrastructure that have been impacted in the past or may be in the future by the various hazard types, to assist with forensic analysis of events, hazard mitigation project approval, and for use in future disaster field offices.
- I. Develop local flood mitigation plans and projects utilizing the Flood Mitigation Assistance Program's planning and project grants.

¹ Federal Emergency Management Agency, Planning for a Sustainable Future: The Link Between Hazard Mitigation and Livability (Washington, DC: September 2000) 5.

<www.fema.gov/library/viewRecord.do?id=1541>

² Clean Air-Cool Planet and Cameron P. Wake, Indicators of Climate Change in the Northeast (New Hampshire: Clean Air-Cool Planet, 2005) 1-3, 10-19. <www.cleanair-coolplanet.org/information/pdf/indicators.pdf>

³ Northeast Climate Impacts Assessment Synthesis Team, Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions (Cambridge, MA: Union of Concerned Scientists, 2007) 1-14.

<www.climatechoices.org/ne/resources_ne/nereport.html>

⁴ *Code of Federal Regulations, 44 CFR Part 206.401*

(Washington, DC: National Archives and Records Information, 2006).

<www.access.gpo.gov/nara/cfr/waisidx_06/44cfr206_06.html>

⁵ FEMA 6-8.

⁶ NH Homeland Security and Emergency Management NH Hazard Mitigation Plan (Concord, NH: 2007) III-1, III-3.

<www.nh.gov/safety/divisions/bem/HazardMitigation/haz_mit_plan.html>

⁷ NH Homeland Security and Emergency Management

⁸ Schiff, R., J.G. MacBroom, and J. Armstrong Bonin, Guidelines for Naturalized River Channel Design and Bank Stabilization, Prepared by Milone and MacBroom, Inc.

(Concord, NH: New Hampshire Departments of Environmental Services and Transportation, 2007) 51-80.

<www.des.state.nh.us/Rivers/guidelines_naturaldesign.htm>

⁹ Merrill, Governor Stephen, "Executive Order 96-4: An Order for State Agencies to Comply with Flood Plain Management Requirements" (Concord, NH: Office of the Governor, July 18, 1996). <www.sos.nh.gov/executive%20orders/merrill1996-4.pdf>

¹⁰ NH Homeland Security and Emergency Management V-1.

¹¹ Conversation with Joanne Morin, Administrator, and Christopher Skoglund, Program Specialist, NH Department of Environmental Services Air Resources Division, November 2007. The *Climate Action Plan* is under development by the Governor's Climate Action Taskforce, publication anticipated August 2008, visit www.des.nh.gov/ard/climatechange/ for more information.

¹² NH Homeland Security and Emergency Management III-3.

¹³ Center for Watershed Protection, Impacts of Impervious Cover on Aquatic Systems (Ellicott City, MD: 2003) 1-54. <www.cwp.org/Downloads/ELC_impacts.pdf>

¹⁴ FEMA 6.